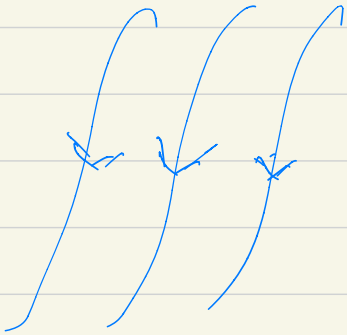


Heat.

It is form of energy which is transfer from one body to another due to temp. diffrance (High temp to low temp)

- It determines change in thermal state of body and occurs due to diffrance in the degree of hotness of two bodies.

Heat flows until there is temp. diff

S.I unit: joule

C.G.S unit: erg.

$$1\,J = 10^7\,erg$$ //

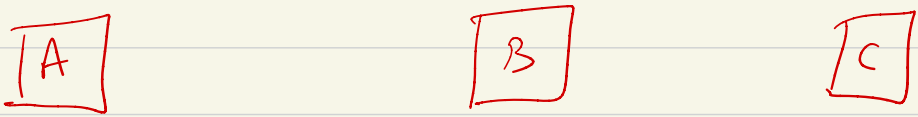
Temperature

It is a measurement of hotness or coldness of an object.

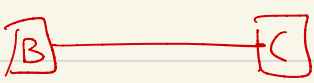
SI unit : kelvin

other unit : °C, °F

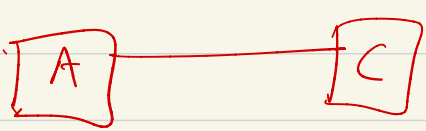
Zeroth law of thermodynamics :



Thermal equilibrium



Thermal equilibrium



∴ Thermal equilibrium

- Study of low temperature is called Cryogenics.

- Study of high temp known as Pyrometry

Temperature Scale :

Let Scale → x

$$\text{Reading} = \frac{x - F.P}{B.P - F.P}$$

F.P → Freezing Point
B.P → Boiling Point

For Celcius

F.P = 0°C B.P = 100°C

For Kelvin

F.P = 273K B.P = 373K

For Fahrenheit

F.P = 32F B.P = 212F

$$\frac{C-0}{100-0} = \frac{K-273}{373-273} = \frac{F-32}{212-32} = \frac{x-FP}{BP-FP}$$

$$\frac{C}{20\times5} = \frac{K-273}{20\times5} = \frac{F-32}{20\times9} = \frac{x-FP}{BP-FP}$$

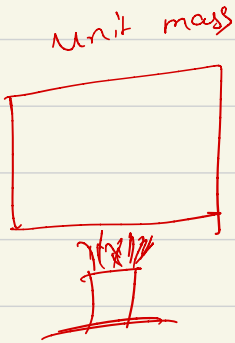
$$\therefore \frac{C}{5} = \frac{K-273}{5} = \frac{F-32}{9} = \left(\frac{x-FP}{BP-FP}\right)20$$

$$C = \frac{5}{9}(F-32)$$

$$K = C + 273$$

Q> There is scale x in which BP & FP are $180x$ & $100x$ what will be the temp in C, F & K when the temp is $116x$.

Q7 A faulty thermometer reads 5° at FP & 95° at BP Find out the temp in °C when it reads 30°



$20^\circ C \rightarrow 21^\circ C$

Specific Heat Capacity

$$1\ cal \simeq 4.2\ J$$

* (H) Thermal Capacity :

It defined as heat per unit change in temp.

$$H = \frac{Q}{\Delta T}$$

S.I unit : J/K

other unit : cal/K

$$H = \frac{Q}{\Delta T}$$

Q → Heat

ΔT → Change in temp

H → Thermal Capacity

Q) The lower and upper fixed points of faulty thermometer are $-2^{\circ}C$ and $102^{\circ}C$, respectively. If the thermometer reads $38^{\circ}C$ on this thermometer, Find the correct temperature on the celcius scale

$$\frac{C}{5} = \left(\frac{x - FP}{BP - FP}\right) 20$$

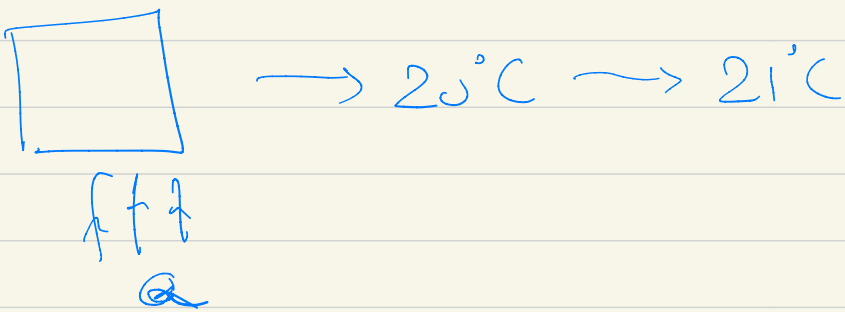
$$\frac{C}{5} = \left[\frac{38 - (-2)}{102 - (-2)}\right] \times 20$$

$$\frac{C}{5} = \frac{40}{104} \times 20$$

$$C = \frac{40 \times 20 \times 5}{104}$$

$$\boxed{C = 38.4^{\circ}C}$$

* Specific Heat Capacity : (C or S)



The amount of heat required for a unit increase in the temperature of unit mass of a substance is called it's specific heat

$$\therefore \quad C = \frac{Q}{m \Delta T}$$

S.I unit : $J/kg \cdot K$

$$\therefore \quad \boxed{Q = mC\Delta T}$$

$m \rightarrow$ mass

$Q \rightarrow$ Heat Energy

$\Delta T \rightarrow$ change in temp.

Q) How much heat is required to raise the temp of 100 g of water from 5°C to 95°C

($C_w = 4200\ J/kg\cdot C$)

C_w -> Specific heat capacity of water

$$Q = m C \Delta T$$

$m = 100g \Rightarrow 10^2 \times 10^{-3} \Rightarrow 10^{-1}\ kg$

$C = 4200$

$\Delta T = 95 - 5 \Rightarrow 90°C$

$Q = 10^{-1} \times 4200 \times 90$

$Q = 4200 \times 9$

$= 37800\ J$

$$\boxed{Q = 37.8\ kJ}$$

Q> 500g of hot water at 60°C is kept in open air till it's temperature falls to 40°C calculate heat energy lost to the surrounding by water ($C_w = 4200\ J/kg°C$)

$$Q = mc\Delta T$$

$$\Delta T = 0$$

Latent Heat

42000 J

Change of Phase :

Solid ⟶ Liquid ⇒ Melting Point

Liquid ⟶ Gas ⇒ Boiling Point.

(L) Latent Heat :

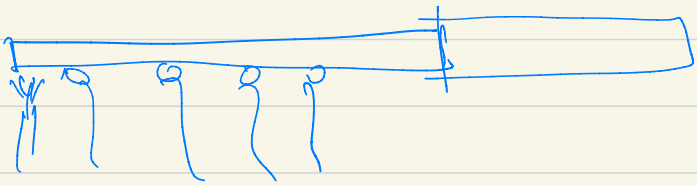
Amount of heat absorbed or released per unit mass of a body during change of state at constant temperature.

$$L = \frac{Q}{m} \qquad Q = mL$$

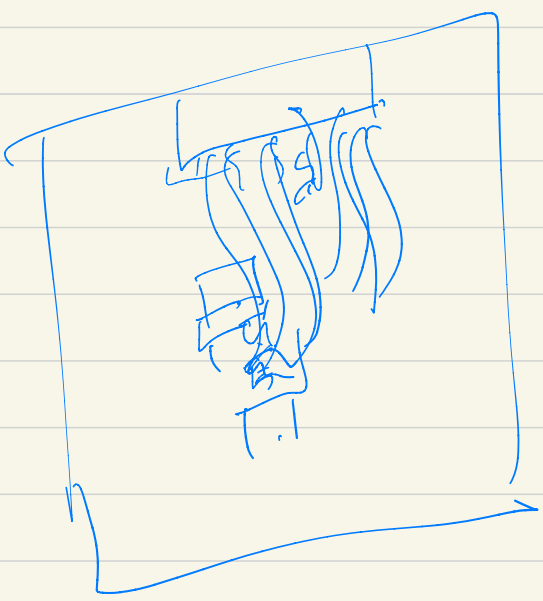
S.I unit : $\frac{J}{kg}$

Latent heat of fusion -
(Solid to liquid)

Latent heat of vaporization -
(liquid to gas)



Solid



liquid, Gas

Heat Transfer

(1) Conduction

- It occurs due to vibration & collision of particle
- Medium is necessary ✓
- It is the slowest of all

(2) Convection

- Air water

Radiation ?

- Electromagnetic wave.
- It is the fastest mode of heat transfer.

Vaccum


Vacuum or Dewar Flask
plastic stopper
vacuum
silvered surface
double glass bulb
double walled
metal or plastic
container
hot or cold
liquid
insulated support
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Without greenhouse effect the average temperature of earth's surface is $-18^{\circ}C$

Conversion of vapour directly to solid is deposition.

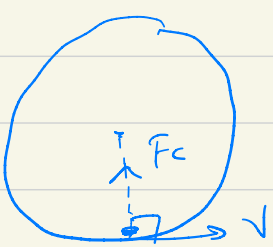
$W = F \cdot S$

→ Displacement

$W = FS\cos\theta$

$\theta = 0^\circ$ $\quad$ $\theta = 180^\circ$ $\quad$ $\theta = 90^\circ$

$W = FS$ $\quad$ $W = -FS$ $\quad$ $W = 0$



$W = 0$

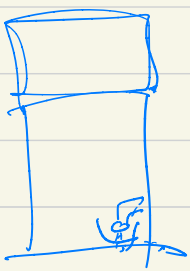
$$v^2 - u^2 = 2as$$

$$PE = mgh$$

m = mass

g = gravity

h = height.



$$KE = \frac{1}{2} m (v^2 - u^2)$$

$$KE = \frac{1}{2} m v^2$$

$$KE = \frac{(mv)\,v}{2} \Rightarrow \frac{pv}{2} //$$

$$\frac{1}{2} m v^2 \; \frac{m}{m} \Rightarrow \frac{m^2 v^2}{2m} \Rightarrow \frac{p^2}{2m} //$$

p → momentum

Power = Work / time

1 H.P = 746 watt

Heat
Work Power Energy } Complete-

FM, AM → Theory